

Face Recognition Vendor Test

FRVT Demonstration Track: Distinguishing Twins
Evaluation Plan
VERSION 1.0

Kayee Hanaoka
Mei Ngan
Patrick Grother
*Information Access Division
Information Technology Laboratory*

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FRVT Twins Demonstration

14 1. Goal and motivation

15 Many face recognition algorithms produce high false match rates (FMR) when comparing images of identical and same-sex
16 fraternal twins. FMR is lower when comparing images of two unrelated persons of the same sex and age. The FRVT Twins
17 Demonstration track is an ongoing opportunity for developers to demonstrate an ability to distinguish between twins.

18 Our quantitative goal is to state a false match rate (FMR) on twins that is a small multiple of FMR on unrelated persons. This
19 should be achieved at decision thresholds (T) for which $FMR_{UNRELATED} \leq 10^{-4}$, as is typical in one-to-one applications.

20 If successful, we would expect false match rate variations across demographics to also improved.

21 2. Technical assumption

22 To support this demonstration, we will initially only use high resolution images (see below) based on the assumption that
23 fine grained features are available in such images to allow twins to be distinguished. We base this assumption on

- 24 1. The claim of US Patent US7369685B2 is valid -- i.e., that features extracted from skin texture (adjacent to the nose,
25 and above the eyebrows) can distinguish twins, given certain minimum resolutions.
- 26 2. That other face recognition architectures (e.g., those based on convolutional neural networks) could access spatial
27 features that would separate twins.

28 The neuroscience literature points to human recognition evolving to use low resolution facial structure, and similarly having
29 difficulty distinguishing twins. This contrasts with trained human reviewers (working in law enforcement etc.) who have
30 long sought standards specifying much higher resolutions for forensic purposes.

31 3. Participation

32 The demonstration uses the identical [API](#), rules, and participation processes of the FRVT one-to-one [verification track](#).

33 Developers should send email to frvt@nist.gov with

- 34 1. A link to the encrypted compiled software implementation of NIST's [API](#)
- 35 2. The core library shall be named as *libfrvt_11_twins_<provider>_<sequence>.so*
- 36 3. An email that explicitly requests entry into the FRVT Twins Demonstration track

37 The differences between FRVT 1:1 Verification and FRVT Twins Demonstration are as follows:

- 38 1. **High resolution photographs** This test will compare high-resolution face images. All images have an inter-eye distance
39 (IED) of 120 pixels or more, good focus, and mild JPEG compression. Developers needing greater resolution should
40 email us.
- 41 2. **Relaxed timing requirements** We recognize that larger images may require more processing times, so we do not
42 require fast processing. The time allowed to prepare a template (embedding) from an image is unlimited. This contrasts
43 with the 1.5 second limit we require in FRVT 1:1. The time allowed to compare templates is unlimited.
- 44 3. **Twins images** We will estimate FMR on images of identical and same-sex fraternal twins, and on unrelated subjects.

45 4. Public reports

46 NIST will establish a dedicated public results webpage. NIST will identify the algorithm and the developing organization
47 and, for all algorithms submitted to the FRVT Twins Demonstration track, we will publish the following information:

- 48 1. FMR on twins and FMR on unrelated individuals at several thresholds, for example as tabulated values and by plotting
49 FMR vs. T (threshold) for each population. Potentially other comparisons of twin and non-twin impostor distributions.
- 50 2. False non-match rates (FNMR) also, and plots of FNMR vs. T.
- 51 3. If FMR on twins and unrelated subjects are similar, we may additionally run the software on other lower-resolution
52 images and tabulate or plot whether FMR degrades on lower resolution images.
- 53 4. NIST will report the same computational resource usage statistics as in FRVT 1:1, including duration of the template
54 generation and template comparison functions.
- 55 5. Results for algorithms submitted to the FRVT Twins Demonstration track will not be posted to the 1:1 track website.
56 (This is not a vehicle to participate in 1:1 without time limits).